



A.D. 1855 N° 107.

SPECIFICATION

OF

EDWARD HAYNES, JUNIOR.

FURNACES.

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1855.



A.D. 1855 N^o 107.

Furnaces.

LETTERS PATENT to Edward Haynes, junior, of Bromley, in the County of Middlesex, Engineer, for the Invention of “**A SMOKE-CONSUMING FURNACE.**”

Sealed the 10th July 1855, and dated the 15th January 1855.

PROVISIONAL SPECIFICATION left by the said Edward Haynes at the Office of the Commissioners of Patents, with his Petition, on the 15th January 1855.

I, EDWARD HAYNES, jun^r, of Bromley, in the County of Middlesex,
5 Engineer, do hereby declare the nature of the said Invention for “**A SMOKE-CONSUMING FURNACE**” to be as follows :—

My Invention relates to smoke-consuming furnaces and fire boxes, formed and arranged as follows :—

1st, a cylindrical grate divided into two semi-cylindrical compartments by a
10 fixed flat internal grate of hollow fire bars or tubes for admitting the passage of water or steam. The cylindrical grate, formed and divided as above mentioned, is placed in the furnace or fire box, so as to rest upon and at the same time turn round upon the periphery, pullies, wheels, or rollers being placed under the periphery for the latter purpose.

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2ndly, a semi-cylindrical grate (open at the diameter), with a flat grate of hollow fire bars or tubes placed across the opening or diameter, so as to turn over. The semi-cylindrical grate is placed in the furnace or fire box, and fixed in an inverted position, and the flat grate is placed across the top or open part, and is mounted, so as to turn about its axis, and in the axis of the semi- 5 cylindrical grate.

3rdly, in place of the above-mentioned combination of grates, I divide the furnace or fire box into compartments by a series of flat grates placed one above the other. The grates of the upper compartments have hollow bars or tubes, as above mentioned, and are mounted, so as to turn over or open into the 10 lower compartments. The upper and lower compartments are connected by flues constructed for the purpose. The objects of this Invention are, 1st, by making the fire bars hollow, to admit the passage of water for preserving the bars from being burnt, and at the same time to heat the water; 2ndly, to obtain such forms and arrangements of grates and compartments by which the 15 fuel in the different divisions can be transposed simultaneously or separately; 3rdly, by the said grates and compartments to so divide the fire that the smoke from the compartments where the fuel is supplied has to pass through the clear fire of the other compartments. Where practical, other forms of grate than the above may be used, and the fire bars may be made solid instead of hollow. 20

When the cylindrical grate as first herein described is used, it is mounted in the furnace, so as to turn over, still resting upon its periphery, but so as to cause both compartments to be at the top alternately, the fuel being always supplied in the lower compartment. The fire in the upper one will always be bright and clear, and the smoke having to pass through the same 25 en route to the chimney will thus be consumed or rarefied.

When the semi-cylindrical and turn-over grates are used and fixed, as before described, the outer edges of the bars of the latter move round close to the bars of the former, and upon the edge of the flat grate are fixed a number of prongs or teeth, and as the grate is turned, these enter and traverse the inter- 30 stices between the bars of the curved grate, and thus (supposing the furnace to be in operation) the fires upon the bars of each respectively will be transposed. The fire upon the flat bars will always be bright and clear, and the fuel will be supplied in the lower grate. The smoke will have to pass through the clear fire on the upper grate, and, as before mentioned, be thereby consumed or 35 rarefied. When the flat grates only are used, the fuel is supplied in the upper compartments, and the smoke from thence is conducted by flues under the clear fire in the lower compartment, and having to pass through the same en route for the chimney is consumed or rarefied, as before mentioned. The coal is

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kept in the upper compartment until it has burnt clear, when the grate is opened, and the clear fire is let down into the lower compartment, and fresh fuel is supplied as before.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed
5 by the said Edward Haynes in the Great Seal Patent Office on the
14th July 1855.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, EDWARD HAYNES, jun^r, of Bromley, in the County of Middlesex, Engineer, send greeting.

10 **WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fifteenth day of January, in the year of our Lord One thousand eight hundred and fifty-five, in the eighteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Edward Haynes, jun^r, Her special licence that I, the said Edward
15 Haynes, jun^r, my executors, administrators, and assigns, or such others as I, the said Edward Haynes, jun^r, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and
20 Ireland, the Channel Islands, and Isle of Man, an Invention for "**A SMOKE-CONSUMING FURNACE,**" upon the condition (amongst others) that I, the said Edward Haynes, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to
25 be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Edward Haynes, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following
30 statement and description thereof, together with the Drawings accompanying this Specification, and the explanation applying to the said Drawings herein contained, that is to say:—

My Invention relates to a smoke-consuming furnace or furnaces, and consists in fitting the same with hollow and other grates, and hollow and solid
35 fire bars, similar in form and arrangement to those shown upon the accompanying Drawings, and as herein-after described, and comprising, first, a hollow grate of a cylindrical or other suitable form, divided into two compartments by

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a flat internal grate or fire bars across the centre inside. The grate thus divided is to be placed in the furnace or fire box in an horizontal position, resting upon its periphery, and mounted upon friction rollers or wheel bearings placed in the furnace to support the grate in the required position, and to admit of its being turned round therein, so that each compartment may be alternately 5 in contact with the heating surface of the boiler or vessel to be acted upon, each compartment respectively being supplied with fresh fuel when undermost, so that the smoke from the fresh fuel in the lower compartment is caused to pass through the clear fire in the upper compartment, and to be thereby consumed or rarefied.

10

Secondly, a hollow grate of a semi-cylindrical form, open at the top or diameter, across which opening I fit a moveable flat grate so as to close the same. The semi-cylindrical or outer grate is to be fixed in the furnace or fire box horizontally in an inverted position, and the flat moveable grate to be placed across the diameter or opening, and mounted upon two centres in the 15 axis thereof at each end, so as to turn round within the curved grate, each side of the flat grate being uppermost alternately; as the flat grate is turned over, the sides thereof pass close to the inside of the curved bars of the fixed grate, and raises the fire therein to the top of the former, and at the same time discharges the spent fire into the latter, where the fresh fuel is to be always 20 supplied. The smoke having to pass through the fire above on the flat grate, which is burnt clear before it is raised en route to the chimney, is consumed or rarefied, as before mentioned. In order that the flat grate may more perfectly scoop up or raise the fire from the hollow grate, the former is fitted with prongs or teeth which traverse the interstices between the bars of the latter.

25

The fire bars and frames or rims of the moveable and fixed grates are intended to be made hollow, so as to allow water to circulate through them, for the double purpose of preventing them from being burnt or increasing their durability, and for heating the water therein; and the water in the boiler or other vessel in which the liquid to be heated is contained, the water being conducted 30 through a gland at each end of the grate, through a stuffing box in the axis of motion of the grates respectively. The fire bars may also be made solid throughout, or portions only solid.

Other forms of grates than those herein described and shewn upon the Drawings may be employed, according to the requirements of the form of the 35 furnace or fire box, the grate or grates being made thereto. The arrangement of compartments, whether by hollow or solid bars enclosed, or open grates and flat grates, must be similar to that herein described. The objects of the same being, 1st, to prevent the bars from being so rapidly destroyed by the action of

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the fire, and at the same time to heat the water more rapidly; 2ndly, the obtaining a form of furnace grates, fire bars, and compartments by which the fire can be divided, and the fuel in the different divisions can be transposed simultaneously, and the compartments themselves also transposed simultaneously; and 3rdly, such a division of the fire that the products of combustion from the fresh fuel supplied in one compartment must all pass through the clear fire of the other compartment or compartments.

The grates may be turned by a lever or wheel fixed on to the gland or grate, as hereafter described.

10

EXPLANATION OF THE DRAWINGS.

The Drawings accompanying this Specification are laid down to a scale of one and half inches to a foot.

Fig. 1 shows an end view of the cylindrical grate; Fig. 2, the side view of the same; Fig. 3, a transverse section through the cylindrical grate at the line *a, a*, Fig. 1. The same parts of the grate are lettered with similar letters in each of these illustrations, so that the following explanation applies to all three :—

A, A, are the end frames of the grate; B, B, side frames; C, C, fire bars or hollow tubes (as the case may be) of the outer grate; D, D, the end frames of the internal flat grate, by which the outer grate is divided into the two compartments E & F; G, G, the friction rollers or wheel bearers, upon which the outer or cylindrical grate is mounted in the furnace. These bearers are placed under the end frames, and when necessary under intermediate frames. The peripheries of these frames are made circular for the whole of the grate to turn round. The grate is turned by means of a lever I, attached to the gland or stud H in front of the furnace, or by a toothed wheel K fixed to the grate, and turned by a pinion L. H, H, the glands, by which the water is conducted through the tubes of the outer or inner grates. These glands are made so as to pack and turn water-tight in suitable adjusting stuffing boxes at each end of the grate, and in its axis of motion, when hollow tubes are used instead of solid fire bars. The two end frames A, A, of the outer grate, and the end frames D, D, of the internal grate, are made hollow, and the tubes are inserted so as to admit of a circulation of water through the whole of the tubes. When the internal grate only is made of tubes, the end frames of the outer grate are made solid, and the two end frames D, D, only are made hollow. The operation of this grate is as follows, viz.: E is the clear fire, and F the fire, where the fuel is to be added, the smoke and products of combustion from which have to pass through the grate D, D, and fire E, and are thus consumed or rarefied.

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When the fire F has burnt clear, and the fire E is burnt down, the grate is turned half way round; the compartments will then be reversed, when fuel being added to E, the clear fire F, now supposed to be spread over the dividing grate, the smoke, &c. from E must pass through it en route to the chimney, and thus be consumed or rarefied, as before stated. 5

Fig. 4 shows an end elevation of the semi-cylindrical grate; Fig. 5, the plan of the top of same; Fig. 6, a transverse section through the line *d, d*, Fig. 5. In these illustrations also similar letters of explanation are used in each Fig., and refer to the same part of the grate in the different positions here shewn.

M, M, are the curved bars or tubes of the semi-cylindrical grate; N, N, the 10 side frames to which they are attached; O, O, the end frames of the flat moveable grate; P, P, the bars or tubes (as the case may be) of the flat grate; Q, Q, the centres or glands upon which the flat grate rests in bearings or stuffing boxes, upon or in which it can be turned over; R, R, the teeth or prongs attached to the sides of the flat grate for traversing the interstices 15 between the bars of the semi-cylindrical grate; the dotted lines P¹, P¹, show the flat grate turned half way over. For the circulation of water through these grates the end and side frames are made hollow, and the tubes inserted therein, as described in the cylindrical grate. The water passes through the glands to and from the flat grate, and through a pipe or pipes to or from the frames and 20 tubes of the hollow grate. The bars of one or both of these last-mentioned grates may be made solid, in which case the end and side frames are made solid also.

When the semi-cylindrical fixed and flat moveable grates are used, their operation is as follows (viz.) :—The fuel is supplied at S, where it is to burn 25 clear. The products of combustion (the previous clear fire is supposed to have been raised and spread over the flat grate above), having to pass through the clear fire above, are consumed or rarefied. When the fire in the hollow grate S has burnt clear, and the fire above it has burnt down, the flat grate is turned over upon its centres Q, Q, when the clear fire will be raised thereby, and the 30 remains of the previous fire on the flat grate will be discharged into the hollow grate, where fresh fuel will be supplied thereto, and the smoke, &c. arising therefrom will have to pass through the clear fire above, and be consumed or rarefied, as before stated.

The form of the furnace may be varied according to the shape of the boiler 35 or vessel in which the water is to be heated. Care must, however, be taken to fit the grate or furnace bars where the fuel is supplied, so that there may be no escape of smoke otherwise than through the clear fire. A close end must be fitted to the semi-cylindrical grate, and the end of the cylindrical grate

FIG. 1.

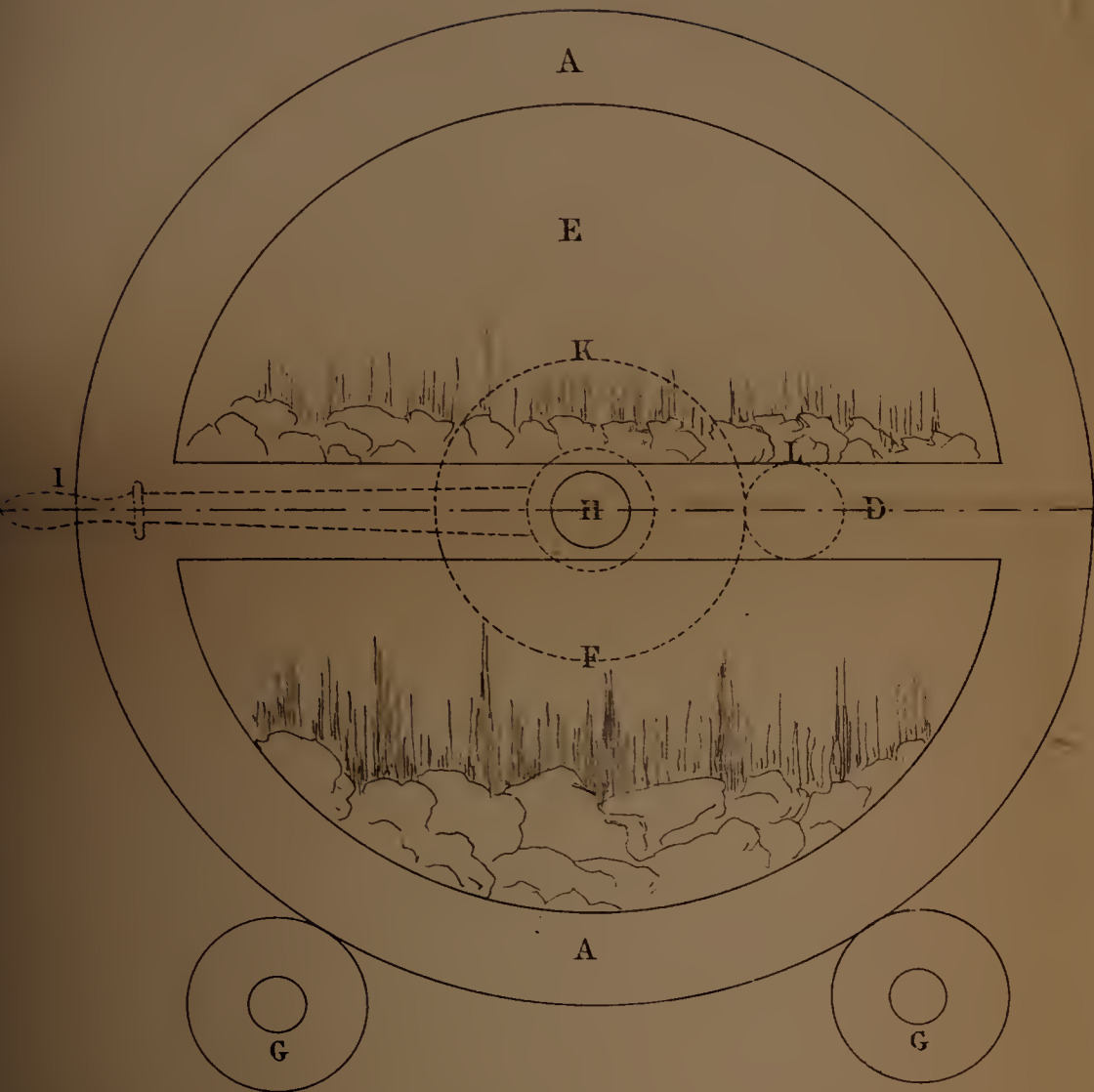


FIG. 2.

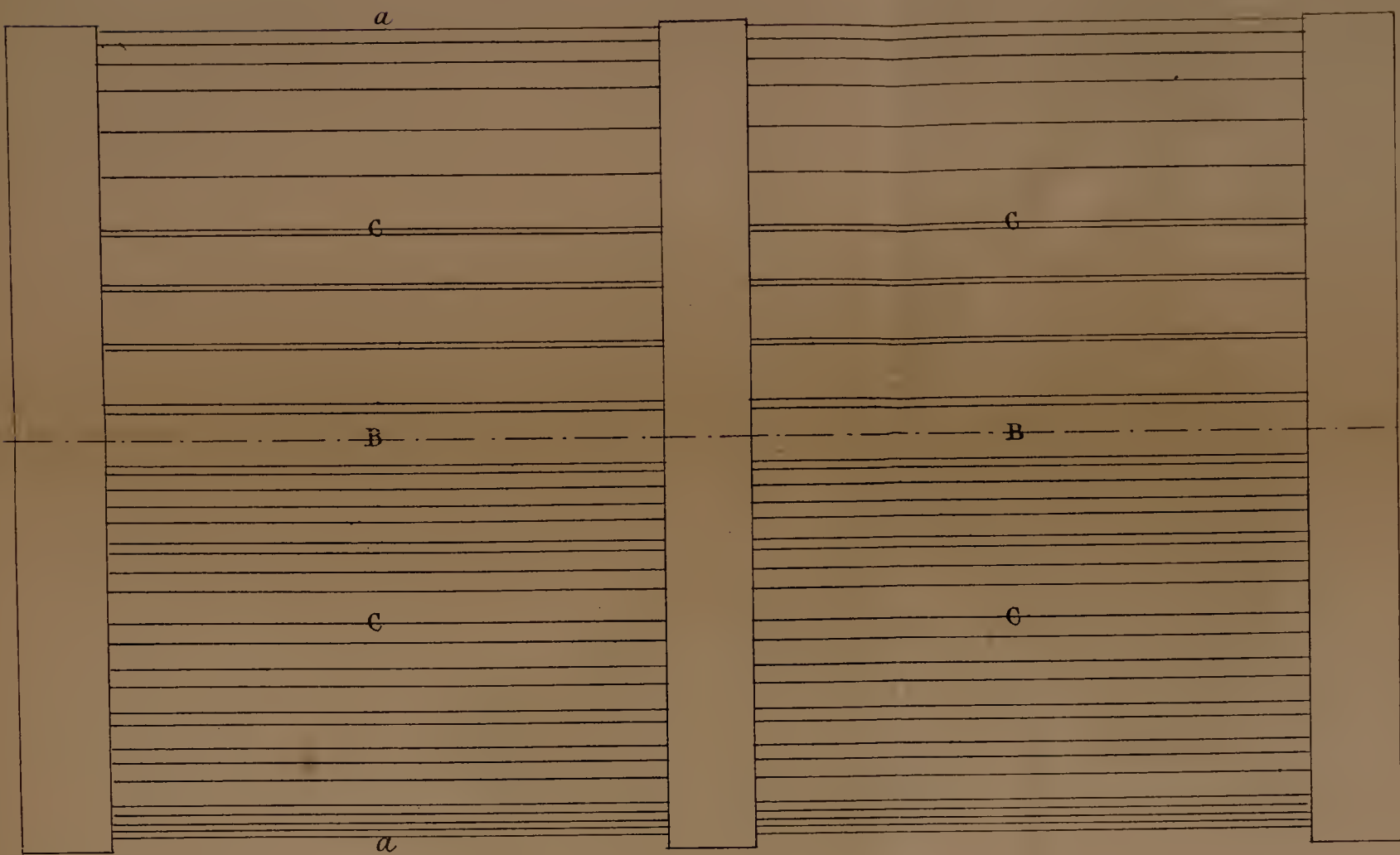


FIG. 3.

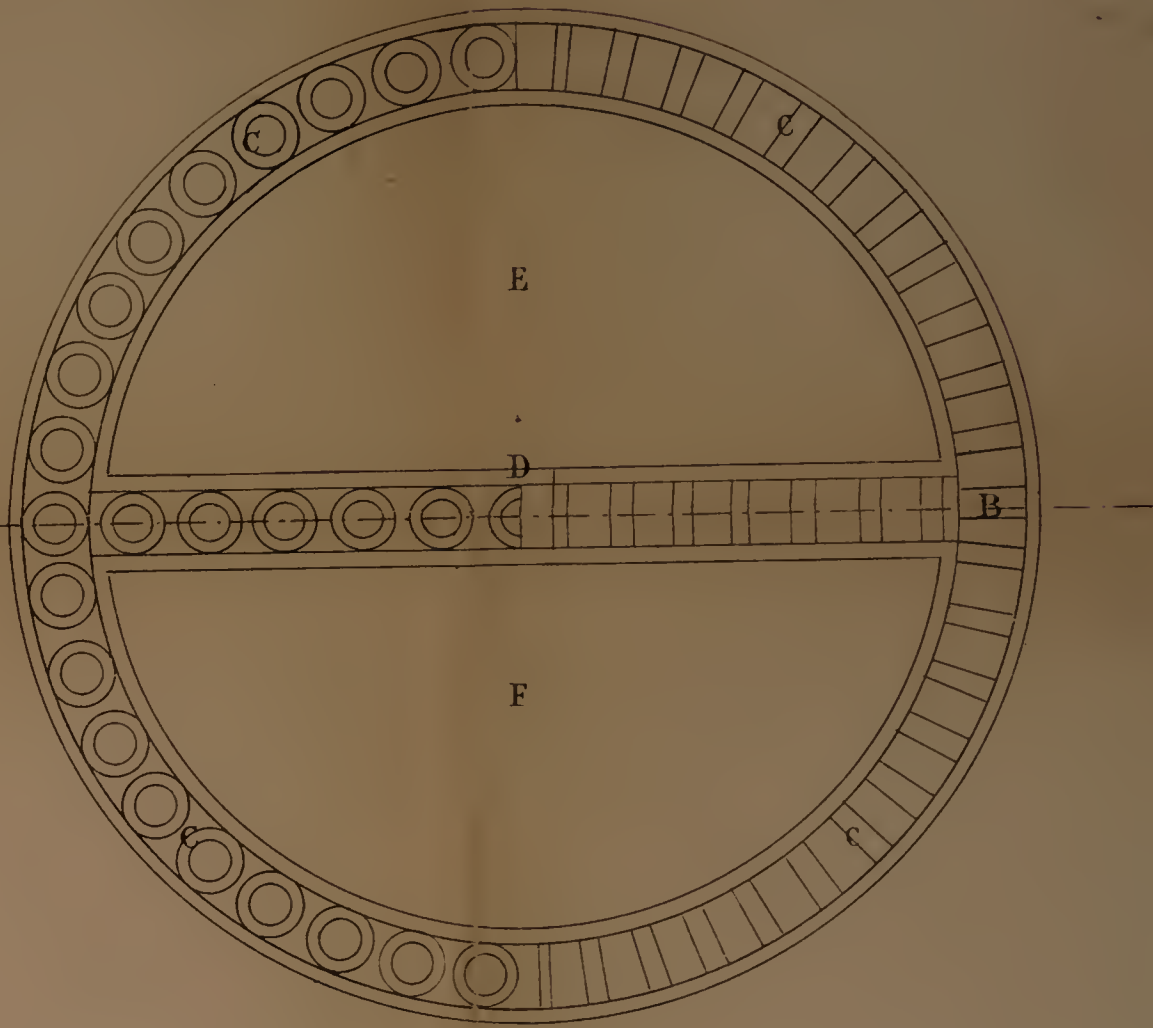


FIG. 4.

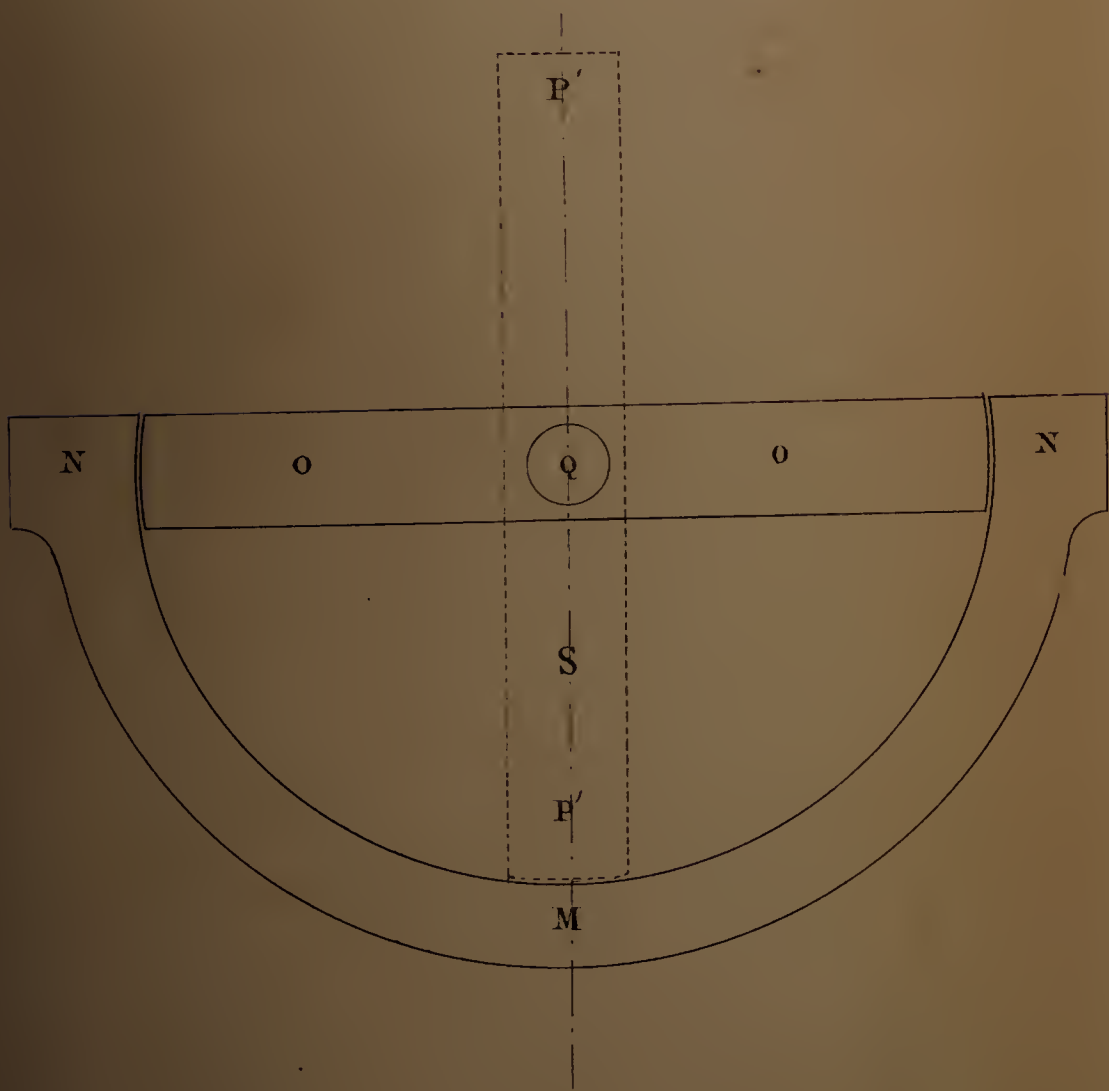


FIG. 5.

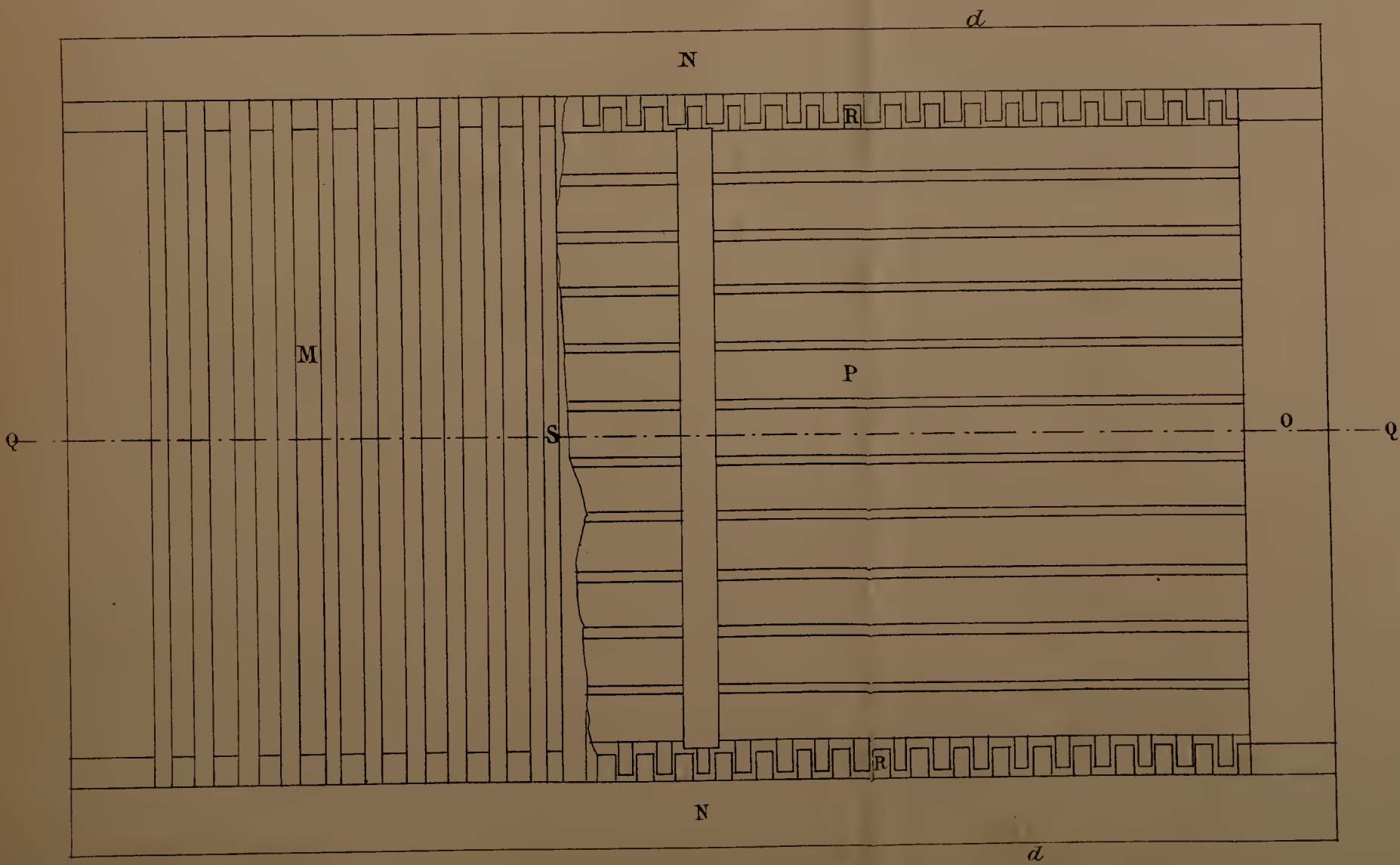
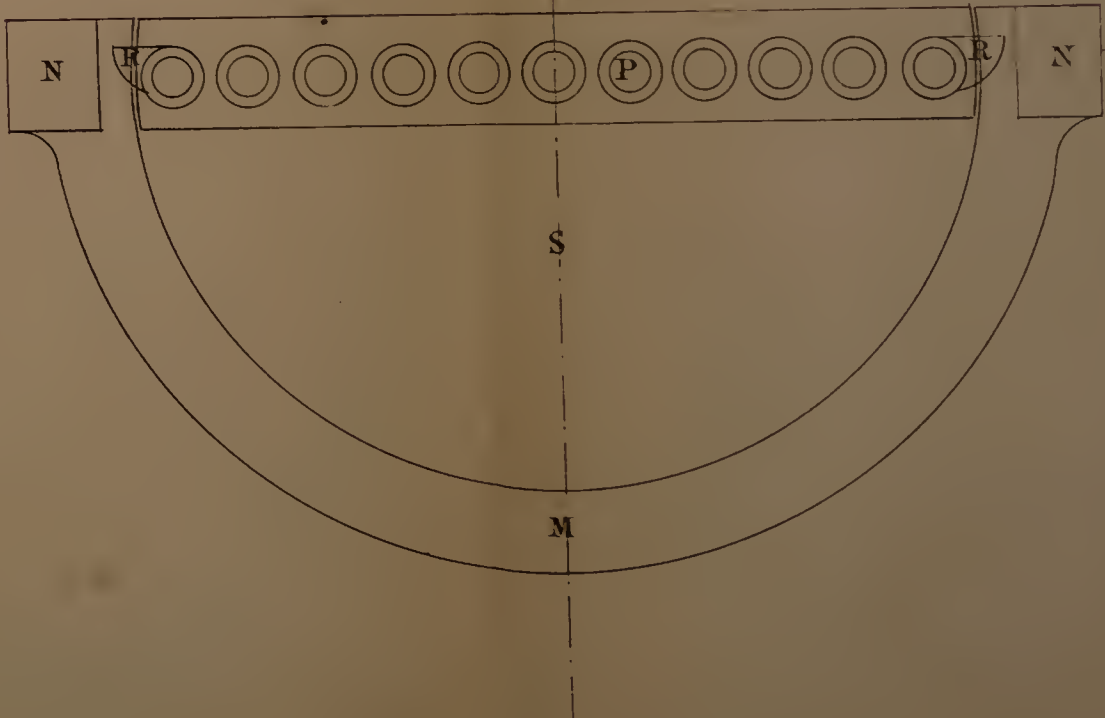


FIG. 6.



The filed drawing is partly colored.

Drawn on Stone by Malby & Sons.

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must fit and turn close against a plate or other suitable stop, by which the ends of the two compartments may be closed alternately as they are each turned down.

I have now to the best of ability described and ascertained the nature of
5 my said Invention; but I do not confine myself to the precise form of furnace
grates or mode of moving, as both may be varied; but claim such variations in
form and mode of moving as may be, so long as the same are included in the
principle of my said Invention.

In witness whereof, I, the said Edward Haynes, jun^r, have hereto set
10 my hand & seal, this Thirteenth day of July, A.D. 1855.

EDWARD (L.S.) HAYNES, J^{N^R}.

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1855.

